* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1]A manufacturing method of a lenticular lens sheet characterized by comprising the following.
A process of exposing said regist layer via said each entering light lens of said substrate by making it irradiating with several parallel beams from which the degree of incidence angle differs as exposure light to a substrate with which a regist layer was formed in the surface of Idemitsu while two or more entering light lenses were formed in the entering light side.
A process of forming a light absorption layer in fields other than a condensing field of each of said entering light lens among the surfaces of Idemitsu of said substrate by developing said regist layer and removing a resist material of an exposure region or an unexposed field among said regist layers.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the lenticular lens sheet which constitutes the transmission type screen used with back projection type projection TV etc., It is related with the manufacturing method of the lenticular lens sheet which forms the shielding pattern (black stripe) of the stripe shape especially provided in the surface of Idemitsu by exposure and development of a resist material, and its device.
[0002]

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PRIOR ART

[Description of the Prior Art]The light source which consists of red from the former, and three green and blue CRT (Cathode Ray Tube), What the back projection type projection TV provided with the transmission type screen for projecting the picture from this light source is known, among these generally combined the Fresnel lens sheet and the lenticular lens sheet as a transmission type screen is used. Here as such a lenticular lens sheet, That by which two or more entering light lenses were formed in the entering light side, and the black stripe was provided in fields other than the condensing field of each entering light lens among the surfaces of Idemitsu is generally used, While diffusing light broadly, the influence of outdoor daylight can be reduced with a black stripe, and contrast can be raised.

[0003]By the way, in such projection TV, What used light sources, such as LCD (Liquid Crystal Display) and DMD (Digital Micro-mirror Device), instead of CRT is developed, It is widely used increasingly in fields, such as a data projector, a computer monitor, digital television broadcasting. However, in the projection TV using LCD, DMD, etc. as a light source, Since the lattice pattern resulting from the cellular structures, such as LCD and DMD, is projected on a transmission type screen, if a picture is projected and observed on the lenticular lens sheet which has a periodic structure, moire may occur by the sampling effect of a lenticular lens sheet.

[0004]For this reason, in the projection TV using LCD, DMD, etc. as a light source, In order to reduce generating of moire effectively, instead of the lenticular lens sheet of a 0.6-1.0-mm lens pitch generally used in the former, the lenticular lens sheet of a small lens pitch of 0.3 mm or less is needed increasingly. In the lenticular lens sheet in which a black stripe is provided in the surface of Idemitsu which mentioned above, In order to realize a diffusing characteristic, contrast, etc. of light which were mentioned above, it is necessary to make thickness of a lenticular lens sheet thin as a lens pitch is made small.

[0005]As a manufacturing method of the lenticular lens sheet in the former here, (1) The method of fabricating the shape (an entering light lens and black stripe) of rear surface both sides at once by extrusion molding, (2) the method (JP,1-159627,A.) of fabricating a lens and a black stripe with radiation-curing nature resin, such as ultraviolet curing nature resin, to both sides of the film base which consists of PETs (polyethylene terephthalate) etc. JP,3-64701,A and referring to JP,3-127041,A are proposed.

[0006]However, by the method of the above (1), among the conventional manufacturing methods mentioned above, Since the thin lenticular lens sheet corresponding to a small lens pitch of 0.3 mm or less which was mentioned above will be fabricated

using resin, such as an acrylic and styrene, mechanical intensity becomes insufficient and utilization is difficult. In fabricating only the shape (for example, entering light lens) of one side of a film base in the method of the above (2), it is satisfactory, but. Since the alignment in both sides of a film base becomes difficult and a manufacturing facility will become very expensive compared with the extruder for extrusion molding, etc. in fabricating the shape (an entering light lens, a black stripe, etc.) of both sides of a film base, utilization is difficult like the method of the above (1).

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the Invention]As explained above, according to this invention. The case [where a dispersing agent is mixed], and Fresnel lens sheet observation-side to the Fresnel lens sheet which constitutes a transmission type screen with a lenticular lens sheet as a condensing system. The lenticular lens sheet which does not cause decline in transmissivity (luminosity) even if it is a case where it is designed can be obtained.

[Translation done.]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]From such a situation, as a practical manufacturing method of the small lenticular lens sheet of a lens pitch, About the shape (entering light lens) of one side of a film base, it fabricates using radiation-curing nature resin, such as ultraviolet curing nature resin, and the method of forming with sufficient accuracy using photolithography method is proposed about the shape (black stripe) of the other sides of a film base. With photolithography method here. it irradiates with a parallel beam from the entering light side of a film base to a film base, and a black stripe is formed by exposing and developing the regist layer formed in the surface of Idemitsu of a film base via the entering light lens (the patent No. 94332 specification.) Refer to JP,49-66135,A and JP,50-136028,A.

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MEANS

[Means for Solving the Problem]As opposed to a substrate for which a regist layer was formed in the surface of Idemitsu while two or more entering light lenses were formed in the entering light side as the 1st solving means as for this invention, By making it irradiate with several parallel beams from which the degree of incidence angle (angle to a normal line direction of a substrate) differs as exposure light, A process of exposing said regist layer via said each entering light lens of said substrate, and by developing said regist layer and removing a resist material of an exposure region or an unexposed field among said regist layers, A manufacturing method of a lenticular lens sheet including a process of forming a light absorption layer in fields other than a condensing field of each of said entering light lens among the surfaces of Idemitsu of said substrate is provided.

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EXAMPLE

[Example]Next, the concrete example of an embodiment mentioned above is described.
[0041]Example 1 Example 1 corresponds, when forming a black stripe among the embodiments mentioned above using the positive-resist material of translucency.
[0042]First, radiation-curing nature resin (ink tech company make: HRF2535) is applied on the roll side of a molding roll by the nozzle coating from a coating unit, Nip of the film base (Toyobo [Co., Ltd.] make: A-4100 and 188 micrometers in thickness) supplied so that a forming roll might be met from a feeding roll using a nip roll to the molding roll with which this radiation-curing nature resin was applied was carried out. Then, while the surface (field where radiation-curing nature resin was applied) of the film base was in contact with the molding roll, with the radiation lamp, it irradiated with radiation from the rear-face side of a film base, radiation-curing nature resin was stiffened, and the film base by which two or more entering light lenses were fabricated by the surface by the side of entering light was formed.
[0043]Next, the surface of Idemitsu of the film base with an entering light lens produced by doing in this way is received, The lamination of the dry film for positives resist (Tokyo adaptation shrine :P. - RZ30, 5 micrometers in thickness, resolution of 15 micrometers) supplied by the feeding roll was carried out with the pressing roll (up-and-down roll), and the positive-resist layer was formed in the surface of Idemitsu of a film base. In lamination speed, by 1-m/, lamination pressure considered it as 90 ** at 2 kg, and lamination temperature carried out the lamination conditions at this time with an up-and-down roll.
[0044]And it exposed via each entering light lens formed in the entering light side of a film base with the exposure light emitted from the exposure device to the film base with a positive-resist layer produced by doing in this way. Exposure at this time was performed by irradiating with a parallel beam with a degree of incidence angle of -10 degree, 0 degree, and +10 degrees in 3 steps to a film base. The exposing condition was set to 75mJ with addition light volume. By such exposure, the positive-resist layer was in the uncured state in the condensing field (exposure region) of the entering light lens, and became as [hardened state] in the non-condensing field (unexposed field).
[0045]Then, the exposed film base with a positive-resist layer produced by doing in this way was developed. The developing condition carried out brushing development after dipping for 1 minute with sodium carbonate 1%. Subsequently, pure water performed washing for 1 minute, and desiccation for 1 minute was performed after washing. The positive-resist material of an exposure region (unhardened field) is removed by such development and washing among the positive-resist layers developed

negatives. Since only the resist material of the unexposed field (hardening field) in which a black stripe should be formed was left behind as a lobe, the black stripe shape whose entering light lens registration suited was able to be obtained.
[0046]And black ink was applied and dried on the lobe which did in this way and was left behind to the surface of Idemitsu of a film base, and the black stripe was formed in fields other than the condensing field of each entering light lens among the surfaces of Idemitsu of a film base. The diffusion zone was formed in the field between the lobes in which the black stripe was formed by applying the resin in which the dispersing agent was mixed in the surface of Idemitsu of the film base which was used in this way, and in which the black stripe was formed, performing wiping processing and making it dry.
[0047]Then, on the exposed portion of the surface of Idemitsu of the film base produced by doing in this way, and the black stripe, the transparent adhesive layer (3 M company make; 9483 and 100 micrometers in thickness) whose transmissivity is higher than positive-resist material was made into the clear layer, and lamination was carried out.
[0048]And the lamination of the acrylic plate manufacturing substrate with a thickness of 2 mm manufactured by extrusion molding on the surface of the adhesive layer by which lamination was carried out by doing in this way was carried out.
[0049]And the lamination of the film with which acid-resisting processing was performed to the surface (observation side surface) of the acrylic plate manufacturing substrate by which did in this way and lamination was carried out to the last was carried out.
[0050]Example 2 Example 2 corresponds, when forming a black stripe among the embodiments mentioned above using the positive-resist material of a light blocking effect.
[0051]First, the film base by which two or more entering light lenses were fabricated was formed in the surface by the side of entering light by the same method as Example 1 mentioned above.
[0052]Next, to the surface of Idemitsu of the film base with an entering light lens produced by doing in this way, the coating processing of the black positive-resist resin (made in FUJI Rex; DANREX) was carried out, and the black positive-resist layer was formed in the surface of Idemitsu of a film base. In the thickness of coating, 2 micrometers (dry state) and drying temperature made [molding speed] the coating conditions at this time 100 ** by 5-m/.
[0053]And it exposed via each entering light lens formed in the entering light side of a film base with the exposure light emitted from the exposure device to the film base with a positive-resist layer produced by doing in this way. Exposure at this time was performed by irradiating with a parallel beam with a degree of incidence angle of -10 degree, 0 degree, and +10 degrees in 3 steps to a film base. The exposing condition was set to 180mJ with addition light volume. By such exposure, the positive-resist layer was in the uncured state in the condensing field (exposure region) of the entering light lens, and became as [hardened state] in the non-condensing field (unexposed field).
[0054]Then, the exposed film base with a positive-resist layer produced by doing in this way was developed. Here, after making the developing solution specified by [which was controlled by 30 **] FUJI Rex immerse for about 30 seconds, ranking second and sponge's performing wiping development for about 30 seconds in the developing solution, it took out from the developing solution and rinsed. The positive-resist material of an exposure region (unhardened field) is removed by such

development and washing among the positive-resist layers developed negatives, Since only the resist material of the unexposed field in which a black stripe should be formed was left behind as a black lobe, the black stripe whose entering light lens registration suited was able to be obtained.

[0055]Then, on the exposed portion of the surface of Idemitsu of the film base produced by doing in this way, and the black stripe, the transparent adhesive layer (3 M company make: 9483 and 100 micrometers in thickness) whose transmissivity is higher than positive-resist material was made into the clear layer, and lamination was carried out.

[0056]And an acrylic plate manufacturing substrate with a thickness of 1.5 mm which consists of a bilayer of the diffusion zone manufactured by bilayer extrusion molding on the surface of the adhesive layer by which lamination was carried out by doing in this way, and a clear layer, The lamination of the diffusion zone (0.3 mm in thickness) of an acrylic plate manufacturing substrate was carried out in the state where the above-mentioned adhesive layer was made to face.

[0057]And the lamination of the film with which low reflection processing and hard court processing were performed to the surface (observation side surface) of the acrylic plate manufacturing substrate by which did in this way and lamination was carried out to the last was carried out.

[0058]Example 3 Example 3 corresponds, when forming a black stripe among the embodiments mentioned above using negative-resist material.

[0059]First, the film base by which two or more entering light lenses were fabricated was formed in the surface by the side of entering light by the same method as Example 1 mentioned above.

[0060]Next, the surface of Idemitsu of the film base with an entering light lens produced by doing in this way is received, The lamination of the dry film for negatives resist (made in Japanese ** Morton: NCP-315, 15 micrometers in thickness, resolution of 10 micrometers) supplied by the feeding roll was carried out with the pressing roll (up-and-down roll), and the negative-resist layer was formed in the surface of Idemitsu of a film base. In lamination speed, by 1-m/, lamination pressure considered it as 90 ** at 2 kg, and lamination temperature carried out the lamination conditions at this time with an up-and-down roll.

[0061]And it exposed via each entering light lens formed in the entering light side of a film base with the exposure light emitted from the exposure device to the film base with a negative-resist layer produced by doing in this way. Exposure at this time was performed by irradiating with a parallel beam with a degree of incidence angle of -10 degree, 0 degree, and +10 degrees in 3 steps to a film base. The exposing condition was set to 75mJ with addition light volume. By such exposure, the negative-resist layer became as [hardened state] in the condensing field (exposure region) of the entering light lens, and was in the uncured state in the non-condensing field (unexposed field).

[0062]Then, the exposed film base with a negative-resist layer produced by doing in this way was developed. The developing condition was considered as the showering development for 1 minute with sodium carbonate 1%. Subsequently, pure water performed washing for 1 minute, and desiccation for 1 minute was performed after washing. The negative-resist material of the unexposed field (unhardened field) in which a black stripe should be formed by such development and washing among the negative-resist layers developed negatives is removed, Since the negative-resist material of the exposure region (hardening field) was left behind as a lobe, the black stripe shape whose entering light lens registration suited was able to be

obtained as concave shape.
[0063]And by doing in this way, applying black ink to the surface of Idemitsu of a film base, performing wiping processing and making it dry, The field (field corresponding to black stripe shape) between the lobes left behind to the surface of Idemitsu of a film base was made to fill up with black ink, and the black stripe was formed in fields other than the condensing field of each entering light lens among the surfaces of Idemitsu of a film base. The surface of Idemitsu of the film base which was used in this way and in which the black stripe was formed is received, After performing resist removing processing for about 1 to 2 minutes in an alkaline aqueous solution 3%, the negative-resist material (lobe) which performed washing for 1 minute with pure water, and was left behind to the surface of Idemitsu of a film base was exfoliated. Thereby, portions other than a black stripe were exposed among the surfaces of Idemitsu of a film base.
[0064]Then, on the exposed portion of the surface of Idemitsu of the film base produced by doing in this way, and the black stripe, the transparent adhesive layer (3 M company make: 9483 and 100 micrometers in thickness) whose transmissivity is higher than negative-resist material was made into the clear layer, and lamination was carried out.
[0065]And an acrylic plate manufacturing substrate with a thickness of 1.5 mm which consists of a bilayer of the diffusion zone manufactured by bilayer extrusion molding on the surface of the adhesive layer by which lamination was carried out by doing in this way, and a clear layer, The lamination of the diffusion zone (0.3 mm in thickness) of an acrylic plate manufacturing substrate was carried out in the state where the above-mentioned adhesive layer was made to face.
[0066]And the lamination of the film with which low reflection processing and antistatic treatment were performed to the surface (observation side surface) of the acrylic plate manufacturing substrate by which did in this way and lamination was carried out to the last was carried out.
[0067]The lenticular lens sheet was manufactured by the same method as Example 3 mentioned above as a comparative example comparative example except for the point that the exposure device performed only one exposure with an irradiation angles of 0 degree.
[0068]Each lenticular lens sheet manufactured in accordance with the method of of Examples 1-3 and the comparative example which carried out evaluation result ****, The observation side condensing point constituted four kinds of transmission type screens combining the Fresnel lens sheet which is 12000 mm, and by using each transmission type screen as a light source, it mounted in the 50-inch back projection type projection TV using LCD, and evaluated. The substrate with which the above-mentioned Fresnel lens sheet made 1.8-mm-thick shock-proof methacrylic resin (refractive index 1.51) carry out 0.06 weight-section (value to substrate 100 weight section before mixing) mixing of the styrene bead (refractive index 1.59) with a mean particle diameter of 12 micrometers, It consists of a lens fabricated by the surface of this substrate with ultraviolet curing nature resin (refractive index 1.55).
[0069]First, viewing estimated shading (luminosity unevenness) of the periphery as the 1st evaluation criteria about each above-mentioned transmission type screen mounted in back projection type projection TV. As a result, as shown in the following table, the good result was obtained compared with the lenticular lens sheet in which the direction of the thing using the lenticular lens sheet manufactured in accordance with the method of Examples 1-3 was manufactured in

accordance with the method of a comparative example. Evaluation was performed by three-stage evaluation (it is shown that a numerical value is large in the following table that it is such a good result).

[0070]Next, as the 2nd evaluation criteria the luminosity in a 5-cm position (four positions) from the central part and the corner of each above-mentioned transmission type screen, It measured with the luminance meter (BM-5 by TOPCON CORP.) in the position 2 m away from each above-mentioned transmission type screen, and the ratio (peripheral luminance ratio) of the average of four luminosity in a 5-cm position was compared from the corner to the luminosity in the central part of each transmission type screen. As a result, as shown in the following table, the good result was obtained compared with the lenticular lens sheet in which the direction of the thing using the lenticular lens sheet manufactured in accordance with the method of Examples 1-3 was manufactured in accordance with the method of a comparative example.

[0071]Finally a part (6x6 cm2) is started from each above-mentioned lenticular lens sheet as the 3rd evaluation criteria, The part is attached to the thing [independent (item) or] (set) combined with the above-mentioned Fresnel lens sheet, The transmissivity and reflectance were measured by the hazemeter (Murakami Color Research Laboratory make: HR-100), and it compared about each of (%), transmissivity, reflectance (%), and transmissivity/reflectance (%). As a result, as shown in the following table, in the lenticular lens sheet manufactured in accordance with the method of a comparative example. With the lenticular lens sheet manufactured in accordance with the method of Examples 1-3, it turns out to the transmissivity of a set falling about by 1/2 to the transmissivity of an item that the transmissivity of a set only falls about by 1/4 to the transmissivity of an item. Namely, when it combines with the Fresnel lens sheet in which the dispersing agent was mixed, Compared with the lenticular lens sheet in which the direction of the thing using the lenticular lens sheet manufactured in accordance with the method of Examples 1-3 was manufactured in accordance with the method of a comparative example, the good result was obtained about decline in transmissivity (luminosity).

[Table 1]

[表：評価結果]

			実施例1	実施例2	実施例3	比較例
評価項目1	感応評価		2	2	3	1
評価項目2	周辺輝度比 [%]		27.6	29.4	37.9	19.3
評価項目3	単品	透過率T [%]	85.2	86.0	84.8	84.1
		反射率R [%]	5.9	8.8	8.2	8.1
		T／R	14.4	9.8	10.3	10.4
	セット	透過率T [%]	67.2	68.7	66.9	48.2
		反射率R [%]	6.3	9.4	9.0	8.9
		T／R	10.7	7.3	7.4	5.4

[Transiation done.]

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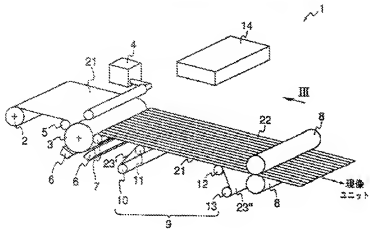
DESCRIPTION OF DRAWINGS

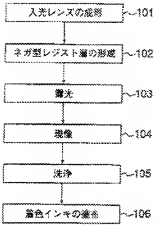
[Brief Description of the Drawings]
[Drawing 1]The perspective view showing the 1 embodiment of the manufacturing installation of the lenticular lens sheet by this invention.
[Drawing 2]Process drawing for describing the 1 embodiment of the manufacturing method of the lenticular lens sheet by this invention.
[Drawing 3]The figure showing typically the situation of the exposure process in the 1 embodiment of this invention.
[Drawing 4]The figure showing an example of the exposure device which can change the angle of exposure light.
[Drawing 5]The figure showing another example of the exposure device which can change the angle of exposure light.
[Drawing 6]The figure showing another example of the exposure device which can change the angle of exposure light.
[Drawing 7]The figure for explaining the angular distribution of the exposure light which enters into a film base.
[Drawing 8]The figure for explaining the characteristic of the lenticular lens sheet manufactured by the manufacturing method concerning the 1 embodiment of this invention.
[Drawing 9]The figure showing typically the situation of the exposure process in the manufacturing method of the conventional lenticular lens sheet.
[Drawing 10]The figure for explaining the characteristic of the lenticular lens sheet manufactured by the conventional manufacturing method.

Drawing selection Drawing 1



[Translation done.]

Drawing selection Drawing 2



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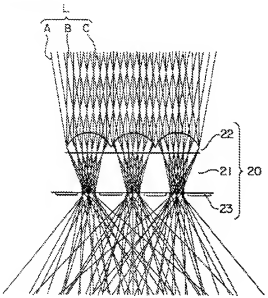
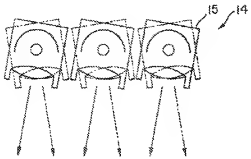


[Translation done.]

Drawing selection Drawing 4



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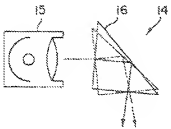
Drawing selection Drawing 5



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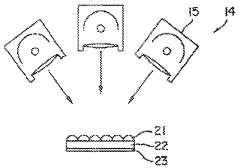
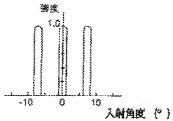
Drawing selection Drawing 6



[Translation done.]

Drawing selection Drawing 7

(a)



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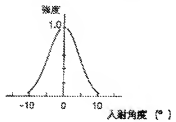

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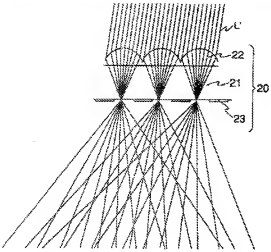
Drawing selection Drawing 8



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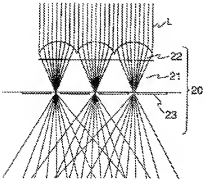
Drawing selection Drawing 9



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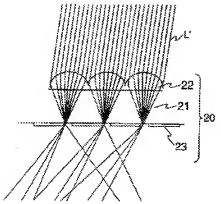
Drawing selection Drawing 10



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